

In the Claims

1. (original) A method of filling vias in a silicon substrate, said method comprising:
 - obtaining a silicon substrate having a plurality of via holes;
 - filling said vias with a high-solids loading paste including a conductor material and a low CTE additive material; and
 - sintering said silicon substrate and paste at a temperature for densification of said metal but not said low CTE additive material.
2. (original) The method of claim 1 further comprising having said paste in the range of 50 to 55 volume percent solids.
3. (original) The method of claim 1 including filling said vias with a metal powder.
4. (original) The method of claim 3 wherein said metal powder comprises copper, silver or gold powder.
5. (original) The method of claim 1 further including adding solvents and dispersants to said high-solids loading paste.
6. (original) The method of claim 1 wherein said paste includes a high-solids loading of approximately greater than 50 volume percent.

7. (original) The method of claim 1 wherein said paste has a suspension viscosity below approximately 1000 centipoise.
8. (original) The method of claim 1 including filling with said low CTE additive comprising a conductor, an insulator, or mixture of both.
9. (original) The method of claim 1 wherein said low CTE additive material comprises glass.
10. (original) The method of claim 1 wherein said low CTE additive material comprises silica, corderite, spodumene, borosilicate glasses, mullite, beta eucryptite, tungsten, magnesium aluminosilicate, or molybdenum.
11. (original) The method of claim 1 wherein said paste includes said low CTE additive material in a range of 20-80 volume percent.
12. (original) The method of claim 11 wherein said paste includes said low CTE additive material in a range of 50-75 volume percent.
13. (original) The method of claim 11 wherein said paste includes an amount of said conductor material is in the range of 20-80 volume percent.

14. (original) The method of claim 13 wherein said conductor material is in the range of 30-45 volume percent.
15. (original) The method of claim 1 further including rheologically tailoring said paste to improve said filling of said vias by combining rheology modifiers.
16. (original) The method of claim 15 including rheologically tailoring said paste by adding rheology modifiers on the order of 0.1 volume percent.
17. (original) The method of claim 1 wherein said sintering temperature of said conductor material is approximately 100oC less than said low CTE additive material sintering temperature.
18. (original) A method of filling empty vias in a silicon substrate, said method comprising:
 - placing said substrate in a vacuum chamber;
 - drawing a vacuum in said vacuum chamber;
 - flooding surfaces of said silicon substrate with a suspension;
 - raising pressure in said vacuum chamber;
 - wiping off excess suspension material;
 - drying said silicon substrate; and
 - sintering said substrate with filled vias.

19. (original) The method of claim 18 including said suspension comprising a conductive material and a low CTE additive material.
20. (original) The method of claim 19 including selecting said suspension such that said conductive material has a sintering temperature approximately 100oC less than said low CTE additive material sintering temperature.
21. (original) A suspension for filling via holes in silicon, comprising a high-solids loading paste including a conductive material and a low CTE additive material.
22. (original) The suspension of claim 21 further comprising having a portion of said suspension include solids in the amount of 50 to 55 volume percent.
23. (original) The suspension of claim 21 including having said conductive material comprise a metal powder.
24. (original) The suspension of claim 23 wherein said metal powder comprises copper, silver or gold powder.
25. (original) The suspension of claim 21 wherein said suspension including solvents and dispersants.

26. (original) The suspension of claim 21 wherein said suspension includes a high-solids loading of approximately greater than 50 volume percent.
27. (original) The suspension of claim 21 wherein said suspension has a viscosity below approximately 1000 centipoise.
28. (original) The suspension of claim 21 including said low CTE additive comprising a conductor, an insulator, or mixture of both.
29. (original) The suspension of claim 21 wherein said low CTE additive material comprises silica, corderite, spodumene, borosilicate glasses, mullite, beta eucryptite, tungsten, magnesium aluminosilicate, or molybdenum.
30. (original) The suspension of claim 21 wherein said suspension includes said low CTE additive material in a range of 20-80 volume percent, corresponding with an amount of said conductive material in the reciprocal range of 20-80 volume percent.